

XV. *Pseudacraea poggei* and *Limnas chrysippus*; *the numerical proportion of mimic to model*. By HORACE A. BYATT, B.A., F.E.S. *With a note by Professor E. B. POULTON, D.Sc., M.A., F.R.S., etc.*

[Read April 5th, 1905.]

PLATE XIV.

THESE butterflies were found among a collection of some 1200 specimens given to me by Père Guillemé of the White Fathers' Mission to Central Africa, under whose direction they were collected at his station at Kayambi, in Awemba country, N.E. Rhodesia, near the sources of the Congo, locally called the Chambezi, between October 1898 and January 1899.

His system was to send out a number of native school-boys—his “gamins,” as he called them—each armed with a net and a book, and orders to capture anything and everything that came in their way, placing their captures between the leaves of the book for safe carrying home.

He particularly mentions that he told his boys to take “des spécimens aussi variés que possible;” and that they would do this literally I know from my own experience of natives, for I have found them generally unable to discriminate between species, and when sent out by me on similar occasions they have returned with large numbers of the insect most in evidence at the moment, and a proportionally smaller number of others. It is, therefore, allowable to suppose that the whole lot which came into my possession gives a very fair idea indeed of the numerical strength of the several species found in the locality.

On opening the papers and examining the specimens—which have suffered a good deal from the damp and neglect of seven years—it was found that roughly one-third of the whole collection consisted of *Limnas chrysippus*, L., and its mimics; and among these latter were seventeen specimens of *Pseudacraea poggei*, Dewitz,—many of them in a fair state of preservation, though, with the rest, they show signs of being unduly pressed between the pages of the book, and are somewhat dulled in colour by damp.

It is due to the suggestion of Professor Poulton that this would be an excellent opportunity to ascertain what numerical relation the *Pseudacraea* bears to its model *chrysippus* that this paper has been hastily prepared in the Hope Department at Oxford before my return to Central Africa.

The country in which Kayambi is situated does not differ greatly from the rest of the plateau to the W. of Lake Nyassa and N.E. Rhodesia. Large stretches of undulating plains, covered with thin scrubby bush or dense tall grass, are intersected at intervals of 5–20 miles by streams and rivers. In the latter months of the year, when these insects were mostly collected, these plains are bare, dry, and dusty, grass and bush being burnt up by the annual bush-fires: and only along the streams is any verdure found. Père Guillemé describes the soil as fertile along the course of the rivers, but elsewhere the district is generally poor and sandy, and for this reason sparsely inhabited, and he remarks on bush-fires being the cause of the general scarcity of insect-life except along the water-courses, where the vegetation is untouched by fires, and where forest-giants, trailing creepers, and tree-ferns flourish.

The altitude of Kayambi is about 3950 ft. above sea-level; and its position roughly 9° 20' S. and 31° 50' E., some two days' march from Fife, and three from Abercorn, on the Nyassa-Tanganyika plateau.

The respective numbers and species in the collection were worked out in the Hope Department and are stated in tabular form below:—

SPECIES.	♂	♀	TOTAL.
<i>Limnas chrysippus</i> . . .	288	79	367
do. do. <i>dorippus</i> . . .	8	4	12
<i>Pseudacraea poggei</i> . . .	—	—	17
<i>Hypolimnas misippus</i> . . .	36	7	45
„ „ ♀ var. <i>inaria</i>		2	

Total number in group 441

From this table it will be seen that *Pseudacraea poggei* is by no means so rare as has been hitherto supposed; its proportion to *L. chrysippus* is no less than 4.72 per cent. The *dorippus*, Kl., or *klugii*, Butl., form of *chrysippus*

is found, but in this whole series of seventeen specimens of *poggei* no individual shows any resemblance to *dorippus*: it is purely a mimic of *chrysippus* and shows no approach to dimorphism. This is explainable on the ground that it is found only where *chrysippus* is the largely predominant form, and, so far as is known, it does not occur in, or has not yet reached, the parts where *dorippus* is relatively abundant—that is, the desert strip along the E. Coast, extending in the E. African Protectorate inland at least to the shores of Victoria Nyanza. In this respect it compares in an interesting manner with *misippus* ♀, of which the *inaria* form, mimicking *dorippus*, is found all over Africa (Trans. Ent. Soc. Lond., 1902, pp. 473–484): and also with *Acræa encedon*, L., var. *daira*, G. and S., which is only frequent in localities where its type *dorippus* is predominant (l. c. pp. 473–484).

This occurrence in considerable numbers of what has hitherto been regarded as the rarest species of *Pseudacræa* supports the hypothesis that the mimics of this group are Müllerian rather than Batesian. This has already been argued for *H. misippus* (cf. Rep. Amer. Assoc. Adv. Sci.—Detroit, 1897; and Trans. Ent. Soc. Lond., 1902, pp. 480 and 483, with references) as well as for the genus *Pseudacræa* and for *A. encedon* (pp. 480, etc.). The fact that the latter species, belonging to a protected and much-mimicked subfamily, is far more coincident geographically with the corresponding forms of its model *H. misippus* ♀ is obviously a powerful argument in favour of the Müllerian interpretation.

NOTE BY PROFESSOR E. B. POULTON, F.R.S.

IT is deeply interesting to compare the details of the mimetic resemblance borne by *Pseudacræa poggei* to *Limnas chrysippus* with those of the other great Nymphaline mimic—*Hypolimnas misippus* ♀. Almost all the points in the following statement can be verified by means of the half-tone reproductions of the three species on the accompanying Plate XIV. It is to be observed, however, that Fig. 1 represents a ♀ *chrysippus* with five wings, a second smaller left hind-wing concealing the central portion of the normal hind-wing of the same side.

As this rare monstrosity was found among the large number of specimens tabulated by Mr. H. A. Byatt it was thought well to select it for representation, inasmuch as the teratological interest is simply an additional advantage which in no way interferes with the bionomic interest of the plate.

The subapical white bar on the fore-wing of *chrysippus* is prolonged downwards and outwards with a slight inward trend by means of a few small marginal spots and a local intensification of the white elements in the fringe. This character is very persistent, and is traceable in the *dorippus* form when the band itself has, except for its costal end, disappeared (compare Fig. 4 with 1). A similar effect is produced in the ♀ *missippus* (Fig. 2) by the position of the last or fifth spot of the band, by a local strengthening of the two rows of whitish hind-marginal lunules, and by the white elements of the fringe. The three narrow interrupted white lines which are thus formed parallel with the hind-margin, persist in the *inaria* form when the band itself is only faintly traceable (compare Fig. 5 with 2). In both *chrysippus* and *missippus* it is obvious, especially in the latter, that this prominent subapical marking is in large part prolonged by the local strengthening or the local persistence of elements which are not part of the bar itself, but belong to the category of marginal markings. In this respect *Pseudacraea poggei* (Fig. 3) stands in considerable contrast with the other two members of the group; for its bar is prolonged—and much more fully prolonged than in the other species—by elements which have the appearance of continuity with the bar itself. If these elements are marginal markings as in *chrysippus* and *missippus* they have been far more subordinated to the subapical bar than in these species. The local strengthening of white elements in the fringe is also somewhat less marked, and plays a less important part in *poggei* than in the others. As regards the few minute spots at the extreme apex of the fore-wing of *chrysippus*, mimetic resemblance is more honoured in the breach by *poggei* than in the too emphasized observance by *missippus* ♀—to say nothing of the very different position of the marking in model and mimic.

In spite of all these differences in detail, the two mimics are by no means unlike; and in general effect

each of them resembles the other more closely than it resembles the model.

The internal contour of the black hind-marginal border of both wings is prolonged inwards along the veins, producing a festooned appearance in *poggei* (Fig. 3) and, to a far smaller degree, in the model (Fig. 1). In the ♀ *misippus* (Fig. 2) this feature is almost wanting. Apart from the contour, the narrow black border of the hind-wings of *poggei* more closely resembles the model than the broader more interrupted and less sharply outlined border of the ♀ *misippus*. At the same time, the two mimies resemble each other in this character more fully than either of them resembles the model, which is widely separated by the row of distinct white spots, which however are very variable, and not infrequently barely traceable. On the under-side of both wings the border of *misippus* (Fig. 2*a*) reproduces the black and white effect of the model (Fig. 1*a*), far better than *poggei* (Fig. 3*a*), in which the white marginal elements are confined to the fringe. On the other hand, in the lighter tint of the veins of the hind-wing under-side and in the colour and texture of the ground-colour, *poggei* is by far the better mimic of the two, while *misippus* is equally superior in the tint of the apical area of the fore-wing under-side beyond the bar. As regards the black discal spots of the hind-wing under-side *poggei* is the closer mimic. The development and shifting outwards of the peripheral spots is an evident special modification, in the direction of the model, of a characteristic feature of the genus *Pseudacraea*. The two small spots nearest to the centre of the wing (see Fig. 3*a*) were only seen in a single specimen out of the seventeen. They indicate the existence of material which may be developed into a still closer likeness to the Danaine model.—E. B. P.